#17

SEQUENCE LISTING

<110> Von Schaewen, Antje

<120> Plant GntI Sequences and the Use Thereof for the Production
of Plants Having Reduced or Lacking N-acetyl Glucosaminyl
Transferase I(GnTI) Activity

<130> 032266-003

<140> US 09/591,466
<141> 2000-06-09

<150> EP 98/08001
<151> 1998-09-12

<160> 14

<170> FastSEQ for Windows Version 4.0

<210> 1
<211> 1669
<212> DNA
<213> Solanum tuberosum

<220>
<221> misc_feature
<222> (659)...(667)
<223> function: Asn codon in this context is a potential
glycosylation site;
product: N-glycosylation consensus sequence;
phenotype: N-glycans modulate protein properties;

<220>
<221> misc_feature
<222> (659)...(667)
<223> standard_name: N-glycosylation site;
label: pot-CHO;
note: GnTI-coding sequences from animals do not
contain this feature.

<220>
<221> CDS
<222> (53)...(1393)
<223> codon_start: 53;
function: initiates complex N-glycans on secretory
glycoproteins;
EC_number: 2.4.1.101;

<220>
<221> CDS
<222> (53)...(1393)
<223> product: beta-1,2-N-acetylglucosaminyltransferase I;

evidence: EXPERIMENTAL;

<220>
<221> CDS
<222> (53)...(1393)
<223> gene: cgl;
      standard_name: gntI;
      label: ORF;
      note: first gntI sequence from potato (unpublished).

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<221> 5'UTR
<222> (15)...(52)

<220>
<221> 3'UTR
<222> (1394)...(1655)

<220>
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<222> (80)...(139)
<223> function: membrane anchor (amino acids 10-29);
      product: hydrophobic amino acid stretch in GnTI;
      standard_name: membrane anchor of a type II Golgi
      protein;

<220>
<221> CDS
<222> (80)...(139)
<223> note: identified by comparison with GnTI sequences
      from animals.

<220>
<221> misc_feature
<222> (1)...(14)
<223> function: used for cloning the cDNA library in
      Lambda ZAPII;
      product: EcoRI/NotI-cDNA adapter;
      number: 1.

<220>
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<222> (1656)...(1669)
<223> product: EcoRI/NotI-cDNA adapter;
      number: 2.

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                                                           Met Arg
                                                            1

ggg aac aag ttt tgc ttt gat tta cgg tac ctt ctc gtc gtg gct gct   106
Gly Asn Lys Phe Cys Phe Asp Leu Arg Tyr Leu Leu Val Val Ala Ala

                                    5   10   15

ctc gcc ttc atc tac ata cag atg cgg ctt ttc gcg aca cag tca gaa   154
Leu Ala Phe Ile Tyr Ile Gln Met Arg Leu Phe Ala Thr Gln Ser Glu
        20   25   30

tat gta gac cgc ctt gct gct gca att gaa gca gaa aat cat tgt aca   202
Tyr Val Asp Arg Leu Ala Ala Ala Ile Glu Ala Glu Asn His Cys Thr
 35   40   45   50

agt cag acc aga ttg ctt att gac aag att agc cag cag caa gga aga   250
Ser Gln Thr Arg Leu Leu Ile Asp Lys Ile Ser Gln Gln Gln Gly Arg
            55   60   65

gta gta gct ctt gaa gaa caa atg aag cat cag gac cag gag tgc cgg   298
Val Val Ala Leu Glu Glu Gln Met Lys His Gln Asp Gln Glu Cys Arg
            70   75   80

caa tta agg gct ctt gtt cag gat ctt gaa agt aag ggc ata aaa aag   346
Gln Leu Arg Ala Leu Val Gln Asp Leu Glu Ser Lys Gly Ile Lys Lys
        85   90   95

tta atc gga gat gtg cag atg cca gtg gca gct gta gtt gtt atg gct   394
Leu Ile Gly Asp Val Gln Met Pro Val Ala Ala Val Val Val Met Ala
        100   105   110

tgc agt cgt act gac tac ctg gag agg act att aaa tcc atc tta aaa   442
Cys Ser Arg Thr Asp Tyr Leu Glu Arg Thr Ile Lys Ser Ile Leu Lys
115   120   125   130

tac caa aca tct gtt gca tca aaa tat cct ctt ttc ata tcc cag gat   490
Tyr Gln Thr Ser Val Ala Ser Lys Tyr Pro Leu Phe Ile Ser Gln Asp
                135   140   145

gga tca aat cct gat gta aga aag ctt gct ttg agc tat ggt cag ctg   538
Gly Ser Asn Pro Asp Val Arg Lys Leu Ala Leu Ser Tyr Gly Gln Leu
            150   155   160

acg tat atg cag cac ttg gat tat gaa cct gtg cat act gaa aga cca   586
Thr Tyr Met Gln His Leu Asp Tyr Glu Pro Val His Thr Glu Arg Pro
        165   170   175

ggg gaa ctg gtt gca tac tac aag att gca cgt cat tac aag tgg gca   634
Gly Glu Leu Val Ala Tyr Tyr Lys Ile Ala Arg His Tyr Lys Trp Ala
        180   185   190

ttg gat cag ctg ttt cac aag cat aat ttt agc cgt gtt atc ata cta   682
Leu Asp Gln Leu Phe His Lys His Asn Phe Ser Arg Val Ile Ile Leu
195   200   205   210

gaa gat gat atg gaa att gct gct gat ttt ttt gac tat ttt gag gct   730
Glu Asp Asp Met Glu Ile Ala Ala Asp Phe Phe Asp Tyr Phe Glu Ala
                215   220   225

                                    Page 3

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gga gct act ctt ctt gac aga gac aag tcg att atg gct att tct tct    778
Gly Ala Thr Leu Leu Asp Arg Asp Lys Ser Ile Met Ala Ile Ser Ser
            230                 235                 240

tgg aat gac aat gga caa agg cag ttc gtc caa gat cct gat gct ctt    826
Trp Asn Asp Asn Gly Gln Arg Gln Phe Val Gln Asp Pro Asp Ala Leu
            245                 250                 255

tac cgc tca gac ttt ttt cct ggt ctt gga tgg atg ctt tca aaa tca    874
Tyr Arg Ser Asp Phe Phe Pro Gly Leu Gly Trp Met Leu Ser Lys Ser
            260             265                 270

act tgg tcc gaa cta tct cca aag tgg cca aag gct tac tgg gat gac    922
Thr Trp Ser Glu Leu Ser Pro Lys Trp Pro Lys Ala Tyr Trp Asp Asp
275                 280                 285                 290

tgg cta agg ctg aaa gaa aat cac aga ggt cga caa ttt att cgc cca    970
Trp Leu Arg Leu Lys Glu Asn His Arg Gly Arg Gln Phe Ile Arg Pro
            295                 300                 305

gaa gtt tgc aga acg tac aat ttt ggt gag cat ggt tct agt ttg ggg    1018
Glu Val Cys Arg Thr Tyr Asn Phe Gly Glu His Gly Ser Ser Leu Gly
            310                 315                 320

cag ttt ttt aag cag tat ctt gag cca att aag cta aat gat gtc cag    1066
Gln Phe Phe Lys Gln Tyr Leu Glu Pro Ile Lys Leu Asn Asp Val Gln
            325                 330                 335

gtt gat tgg aag tca atg gac cta agt tac ctt ttg gag gac aac tat    1114
Val Asp Trp Lys Ser Met Asp Leu Ser Tyr Leu Leu Glu Asp Asn Tyr
            340                 345                 350

gtg aaa cac ttt ggc gac ttg gtt aaa aag gct aag ccc atc cac gga    1162
Val Lys His Phe Gly Asp Leu Val Lys Lys Ala Lys Pro Ile His Gly
355                 360                 365                 370

gct gat gct gtt ttg aaa gca ttt aac ata gat ggt gat gtg cgt att    1210
Ala Asp Ala Val Leu Lys Ala Phe Asn Ile Asp Gly Asp Val Arg Ile
            375                 380                 385

cag tac aga gac caa cta gac ttt gaa gat atc gct cga cag ttt ggc    1258
Gln Tyr Arg Asp Gln Leu Asp Phe Glu Asp Ile Ala Arg Gln Phe Gly
            390                 395                 400

att ttt gaa gaa tgg aag gat ggt gta cca cgg gca gca tat aaa ggg    1306
Ile Phe Glu Glu Trp Lys Asp Gly Val Pro Arg Ala Ala Tyr Lys Gly
            405                 410                 415

ata gta gtt ttc cgg ttt caa aca tct aga cgt gtg ttc ctt gtt tcc    1354
Ile Val Val Phe Arg Phe Gln Thr Ser Arg Arg Val Phe Leu Val Ser
            420                 425                 430
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cct gat tct ctt cga caa ctt gga gtt gaa gat act tag cgaagatatg   1403
Pro Asp Ser Leu Arg Gln Leu Gly Val Glu Asp Thr  *
435                 440             445

attggagcct gagcaacaat ttagacttat ttggtaggat acatttgaaa gagctgacac 1463
gaaaagtatg actaccagta gctacatgca acattttaat gttaatggaa ggaacccact 1523
gcttattgtt ggaatggatg aatcatcacc acatcctatt attcaagttt acaaacataa 1583
agaggaaatg ttgccctata aaaacaaatt ttttgtttct aagaaggaac gttacgatta 1643
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tgagcaactt tggcggccgc gaattc
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<211> 446
<212> PRT
<213> Solanum tuberosum

<400> 2

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        20                  25                  30
Ser Glu Tyr Val Asp Arg Leu Ala Ala Ala Ile Glu Ala Glu Asn His
        35                  40                  45
Cys Thr Ser Gln Thr Arg Leu Leu Ile Asp Lys Ile Ser Gln Gln Gln
    50                  55                  60
Gly Arg Val Val Ala Leu Glu Glu Gln Met Lys His Gln Asp Gln Glu
65                  70                  75                  80
Cys Arg Gln Leu Arg Ala Leu Val Gln Asp Leu Glu Ser Lys Gly Ile
                85                  90                  95
Lys Lys Leu Ile Gly Asp Val Gln Met Pro Val Ala Ala Val Val Val
            100                 105                 110
Met Ala Cys Ser Arg Thr Asp Tyr Leu Glu Arg Thr Ile Lys Ser Ile
        115                 120                 125
Leu Lys Tyr Gln Thr Ser Val Ala Ser Lys Tyr Pro Leu Phe Ile Ser
    130                 135                 140
Gln Asp Gly Ser Asn Pro Asp Val Arg Lys Leu Ala Leu Ser Tyr Gly
145                 150                 155                 160
Gln Leu Thr Tyr Met Gln His Leu Asp Tyr Glu Pro Val His Thr Glu
                165                 170                 175
Arg Pro Gly Glu Leu Val Ala Tyr Tyr Lys Ile Ala Arg His Tyr Lys
            180                 185                 190
Trp Ala Leu Asp Gln Leu Phe His Lys His Asn Phe Ser Arg Val Ile
        195                 200                 205
Ile Leu Glu Asp Asp Met Glu Ile Ala Ala Asp Phe Phe Asp Tyr Phe
    210                 215                 220
Glu Ala Gly Ala Thr Leu Leu Asp Arg Asp Lys Ser Ile Met Ala Ile
225                 230                 235                 240
Ser Ser Trp Asn Asp Asn Gly Gln Arg Gln Phe Val Gln Asp Pro Asp
                245                 250                 255
Ala Leu Tyr Arg Ser Asp Phe Phe Pro Gly Leu Gly Trp Met Leu Ser
            260                 265                 270
Lys Ser Thr Trp Ser Glu Leu Ser Pro Lys Trp Pro Lys Ala Tyr Trp
    275                 280                 285
Asp Asp Trp Leu Arg Leu Lys Glu Asn His Arg Gly Arg Gln Phe Ile
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          290                     295                   300
Arg Pro Glu Val Cys Arg Thr Tyr Asn Phe Gly Glu His Gly Ser Ser
305                 310                     315                 320
Leu Gly Gln Phe Phe Lys Gln Tyr Leu Glu Pro Ile Lys Leu Asn Asp
                325                     330                 335
Val Gln Val Asp Trp Lys Ser Met Asp Leu Ser Tyr Leu Leu Glu Asp
            340                     345                 350
Asn Tyr Val Lys His Phe Gly Asp Leu Val Lys Lys Ala Lys Pro Ile
            355                 360                 365
His Gly Ala Asp Ala Val Leu Lys Ala Phe Asn Ile Asp Gly Asp Val
        370                 375                 380
Arg Ile Gln Tyr Arg Asp Gln Leu Asp Phe Glu Asp Ile Ala Arg Gln
385                 390                     395                 400
Phe Gly Ile Phe Glu Glu Trp Lys Asp Gly Val Pro Arg Ala Ala Tyr
                405                     410                 415
Lys Gly Ile Val Val Phe Arg Phe Gln Thr Ser Arg Arg Val Phe Leu
            420                     425                 430
Val Ser Pro Asp Ser Leu Arg Gln Leu Gly Val Glu Asp Thr
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<210> 3
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<212> DNA
<213> Nicotiana tabacum

<220>
<221> misc_feature
<222> (733)...(741)
<223> function: Asn codon in this context is a potential
      glycosylation site;
      product: N-glycosylation consensus sequence;
      phenotype: N-glycans modulate protein properties;

<220>
<221> misc_feature
<222> (733)...(741)
<223> standard_name: N-glycosylation site;
      label: pot-CHO;
      note: GnTI sequences from animals do not contain
      this feature.

<220>
<221> CDS
<222> (127)...(1467)
<223> codon_start: 127;
      function: initiates complex N-glycans on secretory
      glycoproteins;
      EC_number: 2.4.1.101;

<220>
<221> CDS

<222> (127)...(1467)
<223> product: beta-1,2-N-acetylglucosaminlytransferase I;
      evidence: EXPERIMENTAL;
      gene: cgl;
      standard_name: gntI;

<220>
<221> CDS
<222> (127)...(1467)
<223> label: ORF;
      note: first gntI sequence from tobacco (unpublished).

<220>
<221> 5'UTR
<222> (15)...(126)

<220>
<221> 3'UTR
<222> (1468)...(1723)

<220>
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<222> (154)...(213)
<223> function: membrane anchor (amino acids 10-29);
      product: hydrophobic amino acid stretch in GnTI;
      standard_name: membrane anchor of a type II golgi
      protein.

<220>
<221> misc_feature
<222> (1)...(14)
<223> function: use for cloning the cDNA library in
      Lambda ZAPII;
      product: EcoRI/NotI-cDNA adapter;
      number: 1.

<220>
<221> misc_feature
<222> (1724)...(1737)
<223> product: EcoRI/NotI-cDNA adapter;
      number: 2.

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aacactcata actgaacact gagagactat tcgctttctc ctaaagcctt caatcgaatt 120
cgcacg atg aga ggg aac aag ttt tgc tgt gat ttc cgg tac ctc ctc   168
       Met Arg Gly Asn Lys Phe Cys Cys Asp Phe Arg Tyr Leu Leu
        1   5   10

atc ttg gct gct gtc gcc ttc atc tac aca cag atg cgg ctt ttt gcg   216
Ile Leu Ala Ala Val Ala Phe Ile Tyr Thr Gln Met Arg Leu Phe Ala
 15   20   25   30

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aca cag tca gaa tat gca gat cgc ctt gct gct gca att gaa gca gaa    264
Thr Gln Ser Glu Tyr Ala Asp Arg Leu Ala Ala Ala Ile Glu Ala Glu
         35                  40              45

aat cat tgt aca agc cag acc aga ttg ctt att gac cag att agc ctg    312
Asn His Cys Thr Ser Gln Thr Arg Leu Leu Ile Asp Gln Ile Ser Leu
             50                  55                  60

cag caa gga aga ata gtt gct ctt gaa gaa caa atg aag cgt cag gac    360
Gln Gln Gly Arg Ile Val Ala Leu Glu Glu Gln Met Lys Arg Gln Asp
                 65                  70              75

cag gag tgc cga caa tta agg gct ctt gtt cag gat ctt gaa agt aag    408
Gln Glu Cys Arg Gln Leu Arg Ala Leu Val Gln Asp Leu Glu Ser Lys
         80                  85                  90

ggc ata aaa aag ttg atc gga aat gta cag atg cca gtg gct gct gta    456
Gly Ile Lys Lys Leu Ile Gly Asn Val Gln Met Pro Val Ala Ala Val
95                  100                 105                 110

gtt gtt atg gct tgc aat cgg gct gat tac ctg gaa aag act att aaa    504
Val Val Met Ala Cys Asn Arg Ala Asp Tyr Leu Glu Lys Thr Ile Lys
                 115                 120                 125

tcc atc tta aaa tac caa ata tct gtt gcg tca aaa tat cct ctt ttc    552
Ser Ile Leu Lys Tyr Gln Ile Ser Val Ala Ser Lys Tyr Pro Leu Phe
             130                 135                 140

ata tcc cag gat gga tca cat cct gat gtc agg aag ctt gct ttg agc    600
Ile Ser Gln Asp Gly Ser His Pro Asp Val Arg Lys Leu Ala Leu Ser
             145                 150                 155

tat gat cag ctg acg tat atg cag cac ttg gat ttt gaa cct gtg cat    648
Tyr Asp Gln Leu Thr Tyr Met Gln His Leu Asp Phe Glu Pro Val His
         160                 165                 170

act gaa aga cca ggg gag ctg att gca tac tac aaa att gca cgt cat    696
Thr Glu Arg Pro Gly Glu Leu Ile Ala Tyr Tyr Lys Ile Ala Arg His
175                 180                 185                 190

tac aag tgg gca ttg gat cag ctg ttt tac aag cat aat ttt agc cgt    744
Tyr Lys Trp Ala Leu Asp Gln Leu Phe Tyr Lys His Asn Phe Ser Arg
                 195                 200                 205

gtt atc ata cta gaa gat gat atg gaa att gcc cct gat ttt ttt gac    792
Val Ile Ile Leu Glu Asp Asp Met Glu Ile Ala Pro Asp Phe Phe Asp
             210                 215                 220

ttt ttt gag gct gga gct act ctt ctt gac aga gac aag tcg att atg    840
Phe Phe Glu Ala Gly Ala Thr Leu Leu Asp Arg Asp Lys Ser Ile Met
         225                 230                 235

gct att tct tct tgg aat gac aat gga caa atg cag ttt gtc caa gat    888
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Ala Ile Ser Ser Trp Asn Asp Asn Gly Gln Met Gln Phe Val Gln Asp
    240                 245                 250

cct tat gct ctt tac cgc tca gat ttt ttt ccc ggt ctt gga tgg atg    936
Pro Tyr Ala Leu Tyr Arg Ser Asp Phe Phe Pro Gly Leu Gly Trp Met
255                 260                 265                 270

ctt tca aaa tct act tgg gac gaa tta tct cca aag tgg cca aag gct    984
Leu Ser Lys Ser Thr Trp Asp Glu Leu Ser Pro Lys Trp Pro Lys Ala
                275                 280                 285

tac tgg gac gac tgg cta aga ctc aaa gag aat cac aga ggt cga caa   1032
Tyr Trp Asp Asp Trp Leu Arg Leu Lys Glu Asn His Arg Gly Arg Gln
                290                 295                 300

ttt att cgc cca gaa gtt tgc aga aca tat aat ttt ggt gag cat ggt   1080
Phe Ile Arg Pro Glu Val Cys Arg Thr Tyr Asn Phe Gly Glu His Gly
            305                 310                 315

tct agt ttg ggg cag ttt ttc aag cag tat ctt gag cca att aaa cta   1128
Ser Ser Leu Gly Gln Phe Phe Lys Gln Tyr Leu Glu Pro Ile Lys Leu
    320                 325                 330

aat gat gtc cag gtt gat tgg aag tca atg gac ctt agt tac ctt ttg   1176
Asn Asp Val Gln Val Asp Trp Lys Ser Met Asp Leu Ser Tyr Leu Leu
335                 340                 345                 350

gag gac aat tac gtg aaa cac ttt ggt gac ttg gtt aaa aag gct aag   1224
Glu Asp Asn Tyr Val Lys His Phe Gly Asp Leu Val Lys Lys Ala Lys
                355                 360                 365

ccc atc cat gga gct gat gct gtc ttg aaa gca ttt aac ata gat ggt   1272
Pro Ile His Gly Ala Asp Ala Val Leu Lys Ala Phe Asn Ile Asp Gly
                370                 375                 380

gat gtg cgt att cag tac aga gat caa cta gac ttt gaa aat atc gca   1320
Asp Val Arg Ile Gln Tyr Arg Asp Gln Leu Asp Phe Glu Asn Ile Ala
            385                 390                 395

cgg caa ttt ggc att ttt gaa gaa tgg aag gat ggt gta cca cgt gca   1368
Arg Gln Phe Gly Ile Phe Glu Glu Trp Lys Asp Gly Val Pro Arg Ala
    400                 405                 410

gca tat aaa gga ata gta gtt ttc cgg tac caa acg tcc aga cgt gta   1416
Ala Tyr Lys Gly Ile Val Val Phe Arg Tyr Gln Thr Ser Arg Arg Val
415                 420                 425                 430

ttc ctt gtt ggc cat gat tcg ctt caa caa ctc gga att gaa gat act   1464
Phe Leu Val Gly His Asp Ser Leu Gln Gln Leu Gly Ile Glu Asp Thr
                435                 440                 445

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tacggaggag ctcactgttc tagtgttgaa gggatatcgg cttcttagta ttggatgaat 1637
catcaacaca acctattatt ttaagtgttc agaacataaa gaggaaatgt agccctgtaa 1697
agactataca tgggaccatc ataatcgcgg ccgcgaattc                        1737
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<210> 4
<211> 446
<212> PRT
<213> Nicotiana tabacum

<400> 4

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Ser Glu Tyr Ala Asp Arg Leu Ala Ala Ala Ile Glu Ala Glu Asn His
            35                  40                  45
Cys Thr Ser Gln Thr Arg Leu Leu Ile Asp Gln Ile Ser Leu Gln Gln
        50                  55                  60
Gly Arg Ile Val Ala Leu Glu Glu Gln Met Lys Arg Gln Asp Gln Glu
65                  70                  75                  80
Cys Arg Gln Leu Arg Ala Leu Val Gln Asp Leu Glu Ser Lys Gly Ile
                85                  90                  95
Lys Lys Leu Ile Gly Asn Val Gln Met Pro Val Ala Ala Val Val Val
            100                 105                 110
Met Ala Cys Asn Arg Ala Asp Tyr Leu Glu Lys Thr Ile Lys Ser Ile
        115                 120                 125
Leu Lys Tyr Gln Ile Ser Val Ala Ser Lys Tyr Pro Leu Phe Ile Ser
    130                 135                 140
Gln Asp Gly Ser His Pro Asp Val Arg Lys Leu Ala Leu Ser Tyr Asp
145                 150                 155                 160
Gln Leu Thr Tyr Met Gln His Leu Asp Phe Glu Pro Val His Thr Glu
                165                 170                 175
Arg Pro Gly Glu Leu Ile Ala Tyr Tyr Lys Ile Ala Arg His Tyr Lys
            180                 185                 190
Trp Ala Leu Asp Gln Leu Phe Tyr Lys His Asn Phe Ser Arg Val Ile
        195                 200                 205
Ile Leu Glu Asp Asp Met Glu Ile Ala Pro Asp Phe Phe Asp Phe Phe
    210                 215                 220
Glu Ala Gly Ala Thr Leu Leu Asp Arg Asp Lys Ser Ile Met Ala Ile
225                 230                 235                 240
Ser Ser Trp Asn Asp Asn Gly Gln Met Gln Phe Val Gln Asp Pro Tyr
                245                 250                 255
Ala Leu Tyr Arg Ser Asp Phe Phe Pro Gly Leu Gly Trp Met Leu Ser
            260                 265                 270
Lys Ser Thr Trp Asp Glu Leu Ser Pro Lys Trp Pro Lys Ala Tyr Trp
        275                 280                 285
Asp Asp Trp Leu Arg Leu Lys Glu Asn His Arg Gly Arg Gln Phe Ile
    290                 295                 300
Arg Pro Glu Val Cys Arg Thr Tyr Asn Phe Gly Glu His Gly Ser Ser
305                 310                 315                 320
Leu Gly Gln Phe Phe Lys Gln Tyr Leu Glu Pro Ile Lys Leu Asn Asp
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                           325                   330                   335
Val Gln Val Asp Trp Lys Ser Met Asp Leu Ser Tyr Leu Leu Glu Asp
            340                   345                   350
Asn Tyr Val Lys His Phe Gly Asp Leu Val Lys Lys Ala Lys Pro Ile
            355                   360                   365
His Gly Ala Asp Ala Val Leu Lys Ala Phe Asn Ile Asp Gly Asp Val
            370                   375                   380
Arg Ile Gln Tyr Arg Asp Gln Leu Asp Phe Glu Asn Ile Ala Arg Gln
385                   390                   395                   400
Phe Gly Ile Phe Glu Glu Trp Lys Asp Gly Val Pro Arg Ala Ala Tyr
                405                   410                   415
Lys Gly Ile Val Val Phe Arg Tyr Gln Thr Ser Arg Arg Val Phe Leu
                420                   425                   430
Val Gly His Asp Ser Leu Gln Gln Leu Gly Ile Glu Asp Thr
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<210> 5
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<213> Arabidopsis thaliana

<220>
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<223> function: Asn Codon is a potential glycosylation site;
     product: Consensus sequence for N-glycosylation;
     phenotype: N glycans modulate protein characteristics;
     standard name: N glycosylation site;

<220>
<221> misc_feature
<222> (1185)...(1193)
<223> label: pot-CHO;
     note: absent in animal GnTI sequences.

<220>
<221> CDS
<222> (135)...(1469)
<223> codon_start: 135;
     function: initiates complex N glycans on secretory glycoproteins;
     EC_number: 2.4.1.101;

<220>
<221> CDS
<222> (135)...(1469)
<223> product: beta-1,2-N-acetyl glucosaminyl transferase I;
     evidence: EXPERIMENTAL;
     gene: cgl;
     standard_name: gntI;

<220>
<221> CDS
<222> (135)...(1469)
<223> label: ORF;

note: first gntI sequence from Arabidopsis
(unpublished).

<220>
<221> 5'UTR
<222> (19)...(134)

<220>
<221> 3'UTR
<222> (1470)...(1848)

<220>
<221> CDS
<222> (157)...(215)
<223> function: membrane anchor (amino acids 8-27);
    product: hydrophobic amino-acid region in GnTI;
    standard_name: membrane anchor of a Type II Golgi protein;
    note: identified by comparison with animal GnTI sequences.

<220>
<221> misc_feature
<222> (1)...(18)
<223> function: for preparation of a cDNA library in
    Lambda ACT;
    product: XhoI-cDNA-Adaptor;
    number: 1.

<220>
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<222> (1849)...(1854)
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    number: 2.

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tgtttgtcgt cgat atg gcg agg atc tcg tgt gac ttg aga ttt ctt ctc 170
          Met Ala Arg Ile Ser Cys Asp Leu Arg Phe Leu Leu
          1   5   10

atc ccg gca gct ttc atg ttc atc tac atc cag atg agg ctt ttc cag 218
Ile Pro Ala Ala Phe Met Phe Ile Tyr Ile Gln Met Arg Leu Phe Gln
        15   20   25

acg caa tca cag tat gca gat cgc ctc agt tcc gct atc gaa tct gag 266
Thr Gln Ser Gln Tyr Ala Asp Arg Leu Ser Ser Ala Ile Glu Ser Glu
        30   35   40

aac cat tgc act agt caa atg cga ggc ctc ata gat gaa gtt agc atc 314
Asn His Cys Thr Ser Gln Met Arg Gly Leu Ile Asp Glu Val Ser Ile
45   50   55   60

aaa cag tcg cgg att gtt gcc ctc gaa gat atg aag aac cgc cag gac 362

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                Lys Gln Ser Arg Ile Val Ala Leu Glu Asp Met Lys Asn Arg Gln Asp
                                65                  70                  75

gaa gaa ctt gtg cag ctt aag gat cta atc cag acg ttt gaa aaa aaa     410
Glu Glu Leu Val Gln Leu Lys Asp Leu Ile Gln Thr Phe Glu Lys Lys
            80                  85                  90

gga ata gca aaa ctc act caa ggt gga cag atg cct gtg gct gct gta     458
Gly Ile Ala Lys Leu Thr Gln Gly Gly Gln Met Pro Val Ala Ala Val
        95                  100                 105

gtg gtt atg gcc tgc agt cgt gca gac tat ctt gaa agg act gtt aaa     506
Val Val Met Ala Cys Ser Arg Ala Asp Tyr Leu Glu Arg Thr Val Lys
    110                 115                 120

tca gtt tta aca tat caa act ccc gtt gct tca aaa tat cct cta ttt     554
Ser Val Leu Thr Tyr Gln Thr Pro Val Ala Ser Lys Tyr Pro Leu Phe
125                 130                 135                 140

ata tct cag gat gga tct gat caa gct gtc aag agc aag tca ttg agc     602
Ile Ser Gln Asp Gly Ser Asp Gln Ala Val Lys Ser Lys Ser Leu Ser
                145                 150                 155

tat aat caa tta aca tat atg cag cac ttg gat ttt gaa cca gtg gtc     650
Tyr Asn Gln Leu Thr Tyr Met Gln His Leu Asp Phe Glu Pro Val Val
            160                 165                 170

act gaa agg cct ggt gaa ctg act gcg tac tac aag att gca cgt cac     698
Thr Glu Arg Pro Gly Glu Leu Thr Ala Tyr Tyr Lys Ile Ala Arg His
            175                 180                 185

tac aag tgg gca ctg gac cag ttg ttt tac aaa cac aaa ttt agt cga     746
Tyr Lys Trp Ala Leu Asp Gln Leu Phe Tyr Lys His Lys Phe Ser Arg
        190                 195                 200

gtg att ata cta gaa gac gat atg gaa att gct cca gac ttc ttt gat     794
Val Ile Ile Leu Glu Asp Asp Met Glu Ile Ala Pro Asp Phe Phe Asp
205                 210                 215                 220

tac ttt gag gct gca gct agt ctc atg gat agg gat aaa acc att atg     842
Tyr Phe Glu Ala Ala Ala Ser Leu Met Asp Arg Asp Lys Thr Ile Met
                225                 230                 235

gct gct tca tca tgg aat gat aat gga cag aag cag ttt gtg cat gat     890
Ala Ala Ser Ser Trp Asn Asp Asn Gly Gln Lys Gln Phe Val His Asp
                240                 245                 250

ccc tat gcg cta tac cga tca gat ttt ttt cct ggc ctt ggg tgg atg     938
Pro Tyr Ala Leu Tyr Arg Ser Asp Phe Phe Pro Gly Leu Gly Trp Met
            255                 260                 265

ctc aag aga tcg act tgg gat gag tta tca cca aag tgg cca aag gct     986
Leu Lys Arg Ser Thr Trp Asp Glu Leu Ser Pro Lys Trp Pro Lys Ala
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                    270   275   280

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tac tgg gat gat tgg ctg aga cta aag gaa aac cat aaa ggc cgc caa    1034
Tyr Trp Asp Asp Trp Leu Arg Leu Lys Glu Asn His Lys Gly Arg Gln
285                 290                 295                 300


ttc att gca ccg gaa gtc tgt aga aca tac aat ttt ggt gaa cat ggg    1082
Phe Ile Ala Pro Glu Val Cys Arg Thr Tyr Asn Phe Gly Glu His Gly
                305                 310                 315


tct agt ttg gga cag ttt ttc agt cag tat ctg gaa cct ata aag cta    1130
Ser Ser Leu Gly Gln Phe Phe Ser Gln Tyr Leu Glu Pro Ile Lys Leu
                320                 325                 330


aac gat gtg acg gtt gac tgg aaa gca aag gac ctg gga tac ctg aca    1178
Asn Asp Val Thr Val Asp Trp Lys Ala Lys Asp Leu Gly Tyr Leu Thr
                335                 340                 345


gag gga aac tat acc aag tac ttt tct ggc tta gtg aga caa gca cga    1226
Glu Gly Asn Tyr Thr Lys Tyr Phe Ser Gly Leu Val Arg Gln Ala Arg
    350                 355                 360


cca att caa ggt tct gac ctt gtc tta aag gct caa aac ata aag gat    1274
Pro Ile Gln Gly Ser Asp Leu Val Leu Lys Ala Gln Asn Ile Lys Asp
365                 370                 375                 380


gat gat cgt atc cgg tat aaa gac caa gta gag ttt gaa cgc att gca    1322
Asp Asp Arg Ile Arg Tyr Lys Asp Gln Val Glu Phe Glu Arg Ile Ala
                385                 390                 395


ggg gaa ttt ggt ata ttt gaa gaa tgg aag gat ggt gtg cca cga aca    1370
Gly Glu Phe Gly Ile Phe Glu Glu Trp Lys Asp Gly Val Pro Arg Thr
                400                 405                 410


gca tat aaa gga gta gtg gtg ttt cga atc cag aca aca aga cgt gta    1418
Ala Tyr Lys Gly Val Val Val Phe Arg Ile Gln Thr Thr Arg Arg Val
    415                 420                 425


ttc ctg gtt ggg cca gat tct gta atg cag ctt gga att cga aat tcc    1466
Phe Leu Val Gly Pro Asp Ser Val Met Gln Leu Gly Ile Arg Asn Ser
430                 435                 440


tga tgcaaaacat atgaaggaa aagaagattt tggaccgcat gcagcctcct          1519
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tctagcagct gttaggttgt attgttattt atggatgagt ttgtagagcg gtggggttaa 1579
ctttaacagc aaggaagctc tggtgaccag gctgattggc ttagaagtta tgggaacccc 1639
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Phe Met Phe Ile Tyr Ile Gln Met Arg Leu Phe Gln Thr Gln Ser Gln
            20                  25                  30
Tyr Ala Asp Arg Leu Ser Ser Ala Ile Glu Ser Glu Asn His Cys Thr
        35                  40                  45
Ser Gln Met Arg Gly Leu Ile Asp Glu Val Ser Ile Lys Gln Ser Arg
    50                  55                  60
Ile Val Ala Leu Glu Asp Met Lys Asn Arg Gln Asp Glu Glu Leu Val
65                  70                  75                  80
Gln Leu Lys Asp Leu Ile Gln Thr Phe Glu Lys Lys Gly Ile Ala Lys
                85                  90                  95
Leu Thr Gln Gly Gly Gln Met Pro Val Ala Ala Val Val Val Met Ala
            100                 105                 110
Cys Ser Arg Ala Asp Tyr Leu Glu Arg Thr Val Lys Ser Val Leu Thr
        115                 120                 125
Tyr Gln Thr Pro Val Ala Ser Lys Tyr Pro Leu Phe Ile Ser Gln Asp
    130                 135                 140
Gly Ser Asp Gln Ala Val Lys Ser Lys Ser Leu Ser Tyr Asn Gln Leu
145                 150                 155                 160
Thr Tyr Met Gln His Leu Asp Phe Glu Pro Val Val Thr Glu Arg Pro
                165                 170                 175
Gly Glu Leu Thr Ala Tyr Tyr Lys Ile Ala Arg His Tyr Lys Trp Ala
            180                 185                 190
Leu Asp Gln Leu Phe Tyr Lys His Lys Phe Ser Arg Val Ile Ile Leu
        195                 200                 205
Glu Asp Asp Met Glu Ile Ala Pro Asp Phe Phe Asp Tyr Phe Glu Ala
    210                 215                 220
Ala Ala Ser Leu Met Asp Arg Asp Lys Thr Ile Met Ala Ala Ser Ser
225                 230                 235                 240
Trp Asn Asp Asn Gly Gln Lys Gln Phe Val His Asp Pro Tyr Ala Leu
                245                 250                 255
Tyr Arg Ser Asp Phe Phe Pro Gly Leu Gly Trp Met Leu Lys Arg Ser
            260                 265                 270
Thr Trp Asp Glu Leu Ser Pro Lys Trp Pro Lys Ala Tyr Trp Asp Asp
        275                 280                 285
Trp Leu Arg Leu Lys Glu Asn His Lys Gly Arg Gln Phe Ile Ala Pro
    290                 295                 300
Glu Val Cys Arg Thr Tyr Asn Phe Gly Glu His Gly Ser Ser Leu Gly
305                 310                 315                 320
Gln Phe Phe Ser Gln Tyr Leu Glu Pro Ile Lys Leu Asn Asp Val Thr
                325                 330                 335
Val Asp Trp Lys Ala Lys Asp Leu Gly Tyr Leu Thr Glu Gly Asn Tyr
            340                 345                 350
Thr Lys Tyr Phe Ser Gly Leu Val Arg Gln Ala Arg Pro Ile Gln Gly
        355                 360                 365
Ser Asp Leu Val Leu Lys Ala Gln Asn Ile Lys Asp Asp Asp Arg Ile
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           370                 375                 380
                                                   Ile Ala Gly Glu Phe Gly
Arg Tyr Lys Asp Gln Val Glu Phe Glu Arg           395               400
385                 390                 Asp Gly Val Pro Arg Thr Ala Tyr Lys Gly
Ile Phe Glu Glu Trp Lys                            410               415
                405
Val Val Val Phe Arg Ile Gln Thr Thr Arg Arg Val Phe Leu Val Gly
                420                 425                 430
Pro Asp Ser Val Met Gln Leu Gly Ile Arg Asn Ser
           435                 440
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<220>
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<220>
<221> misc_feature
<222> (6)...(12)
<223> n at positions 6, 9 & 12 = inosine.

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<211> 24
<212> DNA
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<220>
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<220>
<221> misc_feature
<222> (4)...(10)
<223> n at positions 4, 7, & 10 = inosine.

<220>
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<222> 13
<223> n = a, c, g, or t.

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ccanccntrn ccngsraara artc

<210> 9
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<220>

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<220>
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<222> 2
<223> Xaa = Arg or Met.

<220>
<221> VARIANT
<222> 9
<223> Xaa = Asp or Tyr.

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Gln Xaa Gln Phe Val Gln Asp Pro Xaa Ala Leu Tyr Arg Ser
 1   5   10

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<213> Artificial Sequence

<220>
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catggatccc tcgagaagcg tcaggaccag gagtgccggc   40

<210> 14
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<220>
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atcccgggat ccgctacgta tcttcaactc caagttg   37